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Mammals of the Drumheller Area

Hugh C. Smith

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MAMMALS OF THE DRUMHELLER AREA

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MAMMALS OF THE DRUMHELLER AREA

ABSTRACT-The status and occurrence of 52 species of mammals in the Drumheller area is discussed. This area is defined geographically as the portion of Alberta that is situated between 51°N and 52°N latitude and 112°W and 114°W longitude. Of the 52 species discussed, one is considered hypothetical, two are extirpated, two are accidental, eight are rare, 19 are uncommon, and 20 are common or locally common. Two species, for which specimen evidence is lacking, are discussed with respect to their possible occurrence in the area. In a biogeographic discussion, five faunal elements are identified as contributing 27 species to the Drumheller area. Twenty-three species could not be assigned to any faunal element and are placed in a "widespread" category. Two species were excluded from the biogeographic discussion. The Drumheller area is located approximately mid-way between two other areas in Alberta where comparable mammal studies have been conducted. The Drumheller area shares 42 species with the Edmonton area and 43 species with the Foremost area. It was concluded that the Drumheller area is a transition zone where northern and southern forms of mammals meet in almost equal numbers.

INTRODUCTION

The Drumheller study area is between 51°N and 52°N latitude and 112°W and 114°W longitude and encompasses approximately 15000 km^2 (5800 mi^2) (Fig.1). It is known by the National Topographic Map Sheet name as Drumheller 82P.

Excluding the northeastern corner of Calgary, there are only three urban centres in this essentially agriculture area: Strathmore, Drumheller, and Three Hills. Agriculture is a relatively recent event in the history of this area. Before Europeans arrived, native peoples - Blackfoot and Cree - either lived in the area or visited it on a regular basis. The Hand Hills, Wintering Hills, and Knee Hills were areas where Indians made their camps. Records of the first Europeans to visit the area have been lost in the mists of time. However, it is recorded that Peter Fidler was in the Hand Hills in 1792 (Hand Hills Book Committee 1968). No doubt numerous fur traders travelled into and through the area but there is no record of their travels. John Palliser passed through the area in 1859. To him the Hand Hills were "a perfect place for the camp, with pasture that was almost rich, lakes of pure, fresh water, and gullies with a small growth of poplars, while the plain all round the base of the hills was bare and arid" (Spry 1963:216). G. M. Dawson (1885) and J. B. Tyrrell (1887) conducted geological surveys in the area. The first agriculturalists were open range ranchers. Ranches were established in the Rosebud area in 1885 (Hymas 1983) and Carbon in 1895 (Gore 1968). It was not until the early 1900s that a large influx of settlers began and the landscape of the area changed forever.

Stalker (1973) outlined ten physiographic units for the Drumheller area (Fig. 2). He grouped these ten units into four larger units: erosion remnants, uplands, lowlands, and Red Deer Badlands. The erosion remnants include the Hand Hills, Wintering Hills, the Sharp Hill upland, and the Knee Hill Ridge. Besides these erosional uplands, a major upland area is found in the north-central portion of the area. Stalker uses the name "Delburne Upland" to set this area apart from the erosional remnant areas. Included in Stalker's lowland category are: Beiseker Lowland, Bow Lowland, Red Deer Lowland, and Torlea Flats. The Red Deer Lowland is a small segment in the extreme northwest corner of our study area. The Torlea Flats occupy the northeast third of the area and are broken by the Hand Hills upland. The Beiseker Lowland, a large central area west of the Red Deer River, is bordered by the Knee Hills Ridge in the north, the Sharp Hill upland in the southwest, and the Wintering Hills upland in the southeast. The Bow Lowland extends in a narrow band along the southern portion of the study area. These lowland areas have been the most affected by settlement as they have been extensively cultivated. The Red Deer Badlands extend along the Red Deer River and are not suited for any agricultural activity.

The highest point of land in the Drumheller area is Sharp Hill (1128 m above sea level) and the lowest point (649 m above sea level) is in the southeast corner where the Red Deer River exits the study area. The Hand Hills rise 180 m above the surrounding plain and the Wintering Hills rise 122 m above the plain. The physiographic features have had minimal effect on the distribution and movement of mammals in the area.

The major drainage system is the Red Deer River. This river is situated in a deep, wide valley that varies from

1.5 km to 3.2 km wide and from 75 m to 170 m deep. The river rises in the Rocky Mountains 250 km to the west. It enters the study area from the north almost at mid-point, continues south to approximately Drumheller and then southeast to leave the area near Finnegan. Numerous creeks and small streams feed into the Red Deer River, among them are Kneehills Creek, Ghostpine Creek, and Rosebud River. In the extreme south there is a small drainage system of intermittent creeks feeding into the Bow River outside the study area.

The climate of the Drumheller area is relatively uniform with January the coldest month, July the warmest, and June the wettest. The average minimum temperatures occur in January and vary from -13.8°C at Strathmore to -15.6°C at Three Hills. The average maximum temperatures occur in July and vary from 16.5°C at Trochu-Wimborne to 19.2°C at Drumheller. The average annual precipitation over a 30-year period varies from 323.1 mm at Drumheller to 449.6 mm at Strathmore. Average precipitation in June, the wettest month, ranges from 53.1 mm at Trochu-Wimborne to 81.7 mm at Strathmore. (Source: Canadian Climate Normals: Temperature and Precipitation 1951-1980. Publication of the Canadian Climate Program.)

Strong and Leggat (1981) defined an ecoregion as "an area characterized by a distinctive regional climate as expressed by vegetation." The Drumheller study area has portions of four ecoregions: Aspen Parkland, Fescue Grass, Mixed Grass, and Short Grass (Fig. 3). Forty-six percent of the Drumheller study area consists of the Mixed Grass ecoregion. This is the largest component in the area. Next in size are the Aspen Parkland ecoregion at 32%, Fescue Grass at 21%, and Short Grass at 1%.

In recent years there has been a proliferation of local histories on the settlement of the Drumheller area. These local histories tell the story of the people who settled

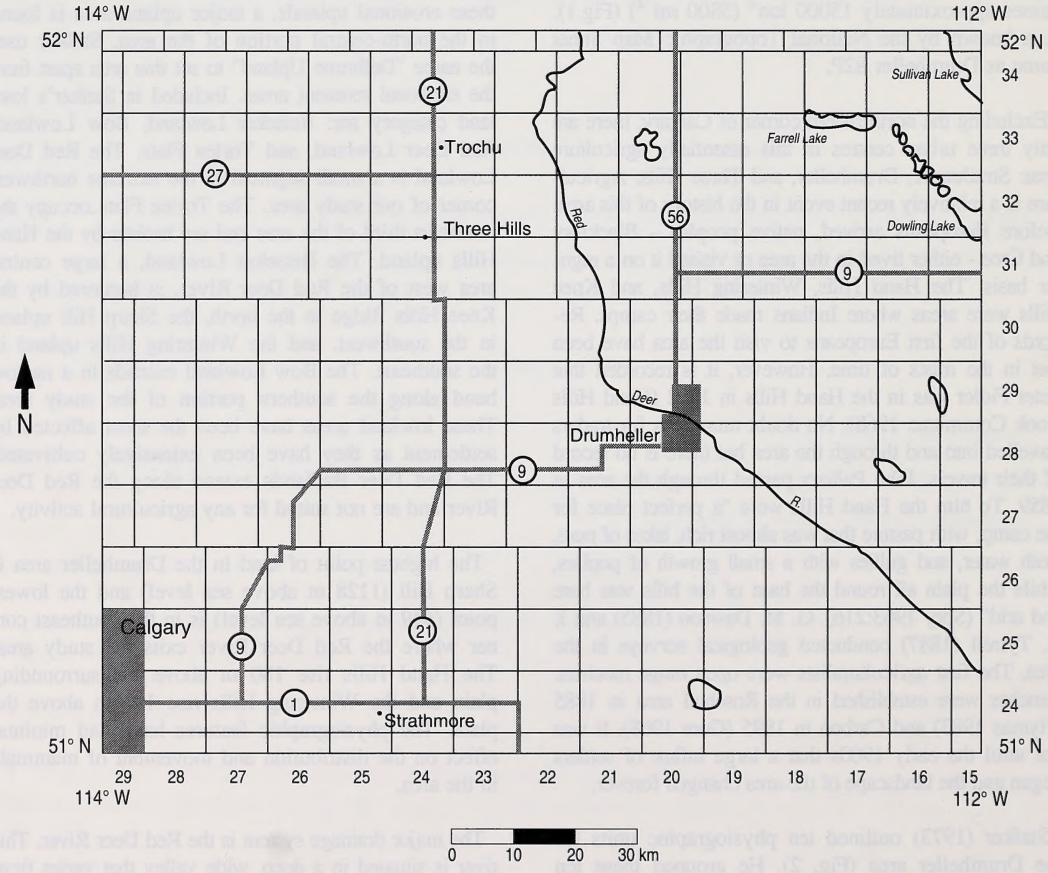

Figure 1. Drumheller study area

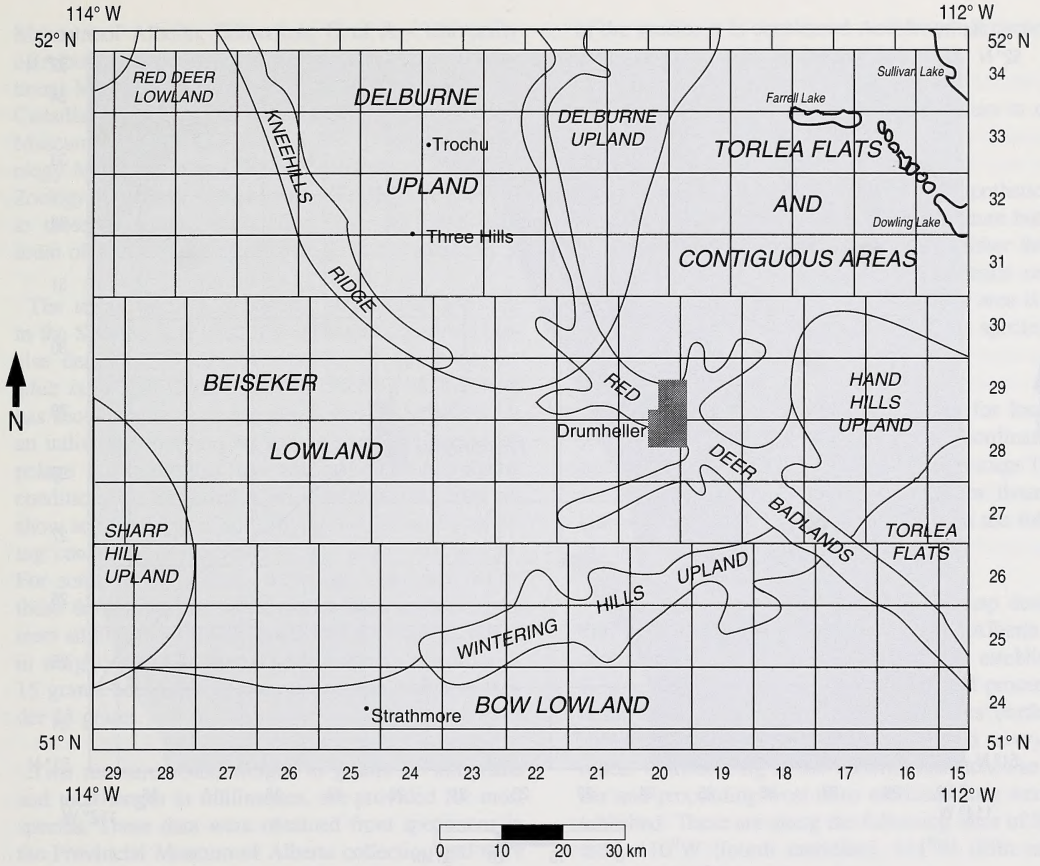

Figure 2. Physiographic areas of the Drumheller area (After Stalker, 1973).

the area. Unfortunately few, if any, include descriptions of the natural history of their particular area. Geological surveys have been conducted since the 1880s (Dawson 1885). Salt (1938, 1939, 1950, 1958) reported several bird observations, Pinel and Wallis (1972) made a botanical survey of the Drumheller area, and Kondla et al. (1973) reported on a study of the birds of the Drumheller area from 1970 to 1972. Other than a few ungulate surveys by Alberta Fish and Wildlife personnel, there has not been a comprehensive study of the mammals of this area. Kondla and Smith (1972) included a list of mammals in their study of Dry Island Buffalo Jump Provincial Park, and Kondla (1977) briefly listed the mammals in his assessment of the proposed Drumheller Provincial Park. Bradley and Bradley (1977) and Fehr (1982) compiled a list of mammals for the Rumsey ecological reserve. Wallis and Wershler (1985) included an annotated checklist of mammals for the Little Fish Lake area. The current study was undertaken to document the mammals that are known to have occurred in the Drumheller Map Sheet 82P. In the Species Accounts that follow, 52 species are discussed. A checklist of mammals for this area is included as Appendix 1.

METHODS

The Provincial Museum of Alberta has been collecting mammals in the Drumheller area since 1967. However, it was not until 1975 that a concerted effort was made to collect mammals systematically. In 1975 two trips were made to the area. One, from 22 to 26 August 1975, was to the Hand Hills and the other, from 25 to 27 September 1975, was to the Wintering Hills. In 1979 a two-day trip was made on 7 and 8 August to the Trochu area; from 20 to 29 July 1982 collecting was carried out in the Dry Island Buffalo Jump area; in 1985, from 10 to 14

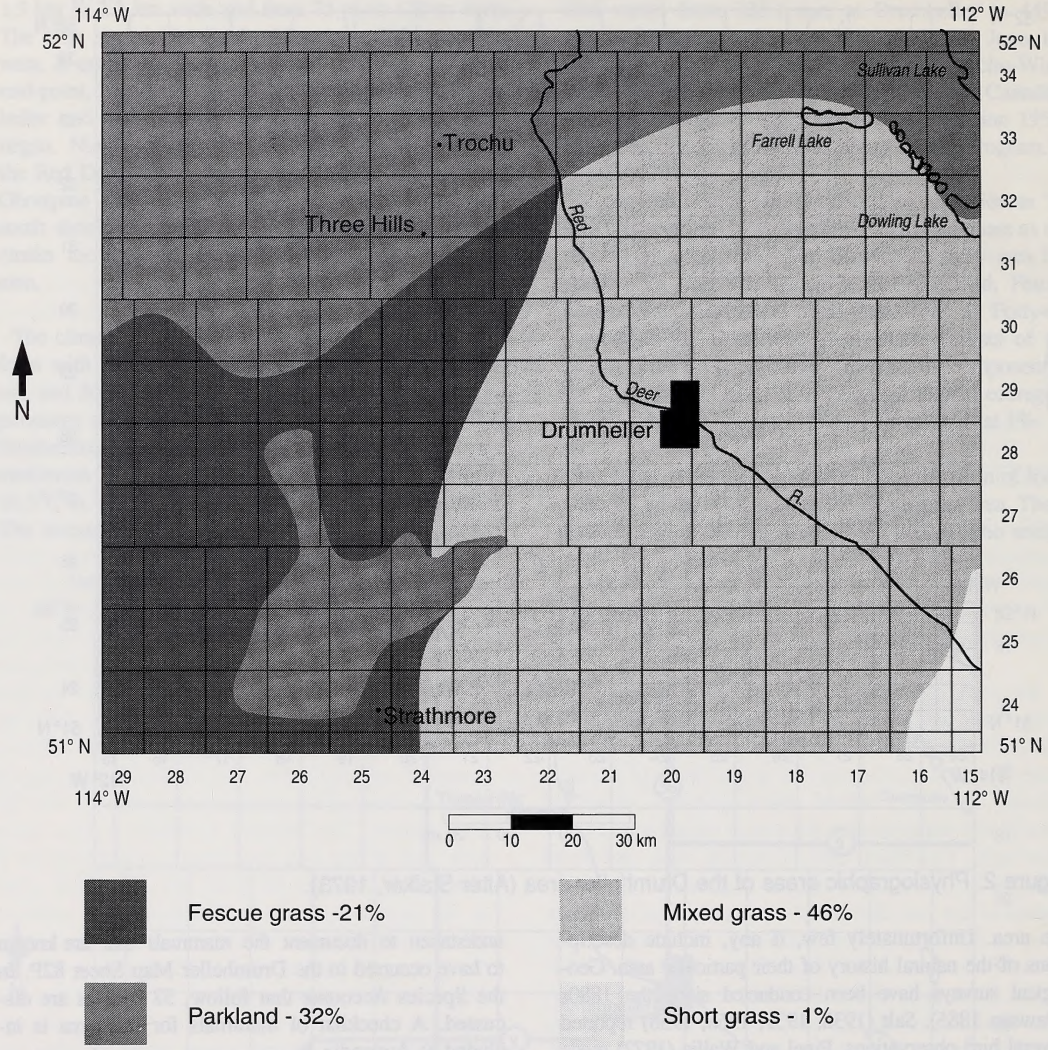

Figure 3. Ecoregions of the Drumheller area.

July, field work was done in the Strathmore area; and from 18 to 20 April 1988 the area between Sunnyslope and Torrington was covered.

In 1986 D. B. Schowalter collected a large number of owl pellets from a number of Great Horned Owl (*Bubo virginianus*) roosts in the area. The bone material recovered from these pellets provided a great deal of information with respect to the distribution of small mammals in the area. In the Species Account section that follows, there are frequent references to this collection and the mammalian bone material that was recovered. Burrowing Owl (*Athene cunicularia*) pellets have also been collected by D. B. Schowalter and Museum personnel from a few places in the study area and the mammalian bones that were recovered from the pellets are referred to (see Appendices 2, 3, 4).

In 1987 and 1988 I contacted or visited several major North American museums to gather information on the holdings each institution had with respect to Alberta mammals. I have used the following abbreviations for these museum collections: PMA - Provincial

Museum of Alberta, Edmonton; U of A - University of Alberta Zoology Museum, Edmonton; NMC - National Museum of Natural Sciences, Ottawa (now the Canadian Museum of Nature); ROM - Royal Ontario Museum, Toronto; U of C - University of Calgary Biology Museum, Calgary; MVZ - Museum of Vertebrate Zoology, University of California, Berkeley. In addition to these museums, information from the Field Museum of Natural History in Chicago is also used.

The terms "adult," "subadult," "immature" are used in the Species Accounts. It is difficult to assign a precise definition to these terms, but in this paper an adult is an individual that is in breeding condition or has shown signs of having borne young. A subadult is an individual that may be fully grown and have adult pelage coloration but has not yet entered breeding condition. An immature is an individual that does not show adult pelage, is not fully grown, is not in breeding condition, and is frequently a young of the year. For some of the rodents, especially mice and voles, these definitions are modified. In these instances, the term adult refers to individuals that are over 20 grams in weight; subadults are those individuals that are over 15 grams but under 20 grams; and immatures are under 15 grams.

Two measurements, weight in grams or kilograms and total length in millimetres, are provided for most species. These data were obtained from specimens in the Provincial Museum of Alberta collection and were taken from specimen reports. If embryos were present and were measured a crown-rump measurement is given in millimetres. The number of specimens used (N) is given along with the mean and the range.

In the Species Accounts, "Status" refers to the relative abundance of a species in the Drumheller area as of 1990. A species is considered to be Common if it is widely distributed in the area and it is frequently encountered. If a species is restricted in distribution the term "locally common" is used.

An Uncommon species is neither widely distributed nor frequently encountered. However, it may be expected to be seen occasionally.

A species is Rare if specimens are known from the area but it is not widely distributed and the opportunity of encountering it is remote and fortuitous.

When a specimen is known from the area but this region is not considered to be within the known range of the species it is considered Accidental. It cannot be expected to occur in the area again.

A species that is locally extinct but occurs in other areas is considered Extirpated.

The status of a species is considered Hypothetical if a record for the species occurs in the literature but due to circumstances the record is suspect. Either the record is not supported by specimen evidence or the range of the species is such that this study area is outside the known range. The chances of the species occurring in the area are extremely remote.

In some of the Species Accounts and for location sites of owl pellet collections, the map coordinates of section, township, and range are used. The maps (Figs. 1, 2, and 3) use township and range. For those not familiar with this type of map designation the following description may be of use.

The section-township-range system of map designation is essentially a grid system. When Alberta was surveyed a series of township lines was established. Beginning at the United States border and proceeding north to the Alberta-Northwest Territories border an east-west township line was established every six miles. Commencing at the Alberta-Saskatchewan border and proceeding west three meridian lines were established. These are along the following lines of longitude: 110°W (fourth meridian), 114°W (fifth meridian), and 118°W (sixth meridian).

Beginning at a meridian line and proceeding west, a north-south range line was established every six miles. Hence, to find a location within this type of system it is necessary to know the township, range, and meridian. The square that is formed by the township and range line is also known as a "township." The 36 square mile township is further subdivided into 36 sections. Each is approximately one mile square. Beginning in the southeast corner of a township and proceeding west then back in a serpentine fashion, each section is numbered from 1 to 36. In the discussions that follow a site may have a designation such as 12-25-15-W4. This means that the site is located in section 12 north of township line 25, west of range line 15, and west of the fourth meridian.

The Drumheller study area encompasses the area from approximately township 24 to township 34 and between range 15 and range 29 west of the fourth meridian.

ANNOTATED SPECIES ACCOUNT

Masked Shrew (*Sorex cinereus*)

Specimen Records: (PMA) Elnora (1), Trochu (3), Rumsey (1)

Status: Uncommon

Based upon trapping records, the Masked Shrew is restricted to the northern portion of the study area. However, by analysing mammal bones found in Great Horned Owl pellets, the range of the species is extended into the east-central part of the area. Remains of 16 individuals were recovered from four sites (Appendix 2). Habitat descriptions in the field notes that accompany the Provincial Museum specimens indicated that the species was taken in areas with a dense understorey of rosebushes and thistles with a canopy of either Aspen Poplar (*Populus tremuloides*) or willow.

Prairie Shrew (*Sorex hayden*i)

Specimen Records: (PMA) Hand Hills (2), Rumsey (1)

Status: Uncommon

The Prairie Shrew occurs throughout the eastern one-third of the study area. The University of Alberta collection has specimens from Calgary and Gleichen both just outside the southern border of our area. This suggests that the species may occur throughout the southern portion of the study area. Analysis of skeletal remains found in the pellets of Great Horned Owls identified 14 individuals from five different sites within the study area (Appendix 2). Habitat data from field notes accompanying Provincial Museum specimens indicate collections were made from a gravel quarry in the Hand Hills and from a grassy area that borders a slough.

Dusky Shrew (*Sorex monticolus*)

Specimen Records: (PMA) Hand Hills (1 adult male, 1 adult sex not determined), Wintering Hills (3 adult females)

Status: Uncommon

Specimens have been collected at two sites in the Hand Hills and one site in the Wintering Hills. In addition, three individuals from three different sites were identified from bones recovered from Great Horned Owl pellets (Appendix 2). Essentially, this species is found in the southeast one-quarter of the area. The specimen from the Hand Hills was collected on a south-facing slope that was covered with grass and buckbrush while the specimens from the Wintering Hills were collected in an area of "long grasses."

Measurements:
Neither sex nor age determined (N = 5) Weight: mean 5.06 g (range 4.5 g to 5.6 g). Total length: mean 106.4 mm (range 100 mm to 111 mm).

Little Brown Bat (*Myotis lucifugus*)

Specimen Records: (PMA) Rumsey (1 adult male), Strathmore (13 adult females, 2 immature males). (ROM) Munson Ferry 1

Status: Uncommon

Although widely distributed in the area, the Little Brown Bat is not common. Nursery colonies have been found in the western half of the area and lone individuals have been seen at various places along the Red Deer River. Control measures have been initiated at some nursery colonies. For example, in 1974 in the Wimborne area a colony of more than 250 was eliminated (D. B. Schowalter pers. comm.). The absence of trees and permanent water may be a factor in the low population in the eastern half of the study area.

Of the 13 adult females collected 30 June 1978, five were pregnant. The embryos ranged in size (crown-rump length) from 17 mm to 26 mm.

Measurements:
Females (N = 13) Weight: mean 9.79 g (range 8.2 g to 12.3 g). Total length: mean 91.1 mm (range 83 mm to 95 mm).
Male (N = 1) Weight: 8.3 g. Total length 90.0 mm.

Long-eared Bat (*Myotis evotis*)

Specimen records: (PMA) Drumheller (1 adult female), Dry Island Buffalo Jump (2 adult females, 3 adult males), Hesketh (1 adult female, 1 immature male), Rumsey (3 adult females, 1 adult male, 1

immature male), Trochu 4. (NMC) Red Deer River near Rumsey 4

Status: Common

Although this species is known from other places in Alberta, the greatest concentration of reports is from along the Red Deer River, especially from this study area. Roosts are selected near water and trees. Rock outcrops along the Red Deer River probably are preferred roost sites but the only known nursery colony in the area is in a building in the community of Hesketh. Nothing is known about the life history of this species in Alberta. Like other Alberta bats, the Long-eared Bat has one young per year. Among the specimens listed above, one female, collected 7 July 1981, carried one fetus with a crown-rump length of 20 mm. The earliest date of capture was 1 May 1980 and the latest date of capture was 9 September 1977.

Measurements:
Females (N = 7) Weight: mean 7.46 g (range 6.4 g to 9.3 g). Total length: mean 96.4 mm (range 92 mm to 103 mm).
Males (N = 4) Weight: mean 6.8 g (range 6.5 g to 7.1 g). Total length: mean 92.5 mm (range 91 mm to 96 mm).

Two immature males weighed 4.9 g and 5.7 g with total lengths of 86 mm and 89 mm.

Western Small-footed Bat (*Myotis ciliolabrum*)

Specimen Records: (PMA) Drumheller (1 immature male), Trochu (1 adult female, 1 sex and age not determined), Rumsey (1 adult male). (NMC) Red Deer River near Rumsey 2

Status: Uncommon

This species reaches the northern limit of its range in this area. The only place it has been collected is in the vicinity of the Red Deer River. Roosting sites are not known. At Dinosaur Provincial Park it has been found in natural caves in the badlands and it is believed that it uses similar situations in this area (PMA unpublished data).

No life history information is known for the species in this area.

Silver-haired Bat (*Lasionycteris noctivagans*)

Specimen Records: (PMA) Craigmyle (1 adult female), Drumheller (1 immature male), Trochu (1 immature female). (U of A) Drumheller 1. (ROM) Carbon, Knee Hills 1

Status: Uncommon

The specimens that are housed in the Provincial Museum collection have been captured in late summer (7 August 1974) or early fall (10 and 20 September 1982). There is nothing to suggest that this bat is a summer resident. One specimen, an immature female, was caught in a mist-net placed across a small pond in open grassland in the Red Deer River valley. Two other species (one Western Small-footed Bat and one Hoary Bat) were caught at the same site at the same time. Because the Silver-haired Bat is a migrant in the area, it can be expected to occur throughout the region. It is most likely to be encountered, however, in the vicinity of the Red Deer River.

Big Brown Bat (*Eptesicus fuscus*)

Specimen Records: (NMC) Red Deer River near Rumsey 3. (ROM) Munson Ferry 1

Status: Uncommon

Because there are no known maternity colonies in this area, this species is regarded as transient. The specimens that are known from the area have been collected from near the Red Deer River. Skeletal elements of this species have been recovered from Great Horned Owl pellets (Appendix 2). Barbour and Davis (1969) stated that this species prefers buildings, bridges, or trees for summer roosts. Gunson (1973) found that in Alberta, older houses were the preferred sites for this bat in summer. Because of the limited number of preferred sites in the study area, the status of this species is uncommon.

Hoary Bat (*Lasiurus cinereus*)

Specimen Records: (PMA) Drumheller (1 immature male), Trochu (1 immature female)

Status: Uncommon

This is a solitary, tree-roosting bat that is not frequently encountered. Schowalter (1979) suggested that

young may be raised in the area. This is supported by the immature male that was obtained at Drumheller. This specimen, captured 10 July 1975, weight 18.3 g, was observed falling from a larger bat. Bogan (1972) reported that female Hoary Bats will carry their young while feeding. The Trochu specimen, captured in a mist-net 7 August 1979, weighed 22.2 g. The mist-net was placed across a small pond that was located in the Red Deer River valley. Two other species, one Western Small-footed Bat and one Silver-haired Bat were caught at the same time. There are no life history data available on this bat in Alberta but Schowalter (1979) indicated that it is a migratory species with fall migration occurring in late August.

Nuttall's Cottontail (*Sylvilagus nuttallii*)

Specimen Records: (NMC) Munson Ferry (1), Red Deer River 9 miles NW Drumheller (1). (Field Museum) Hand Hills (1)

Status: Common

On the basis of museum specimen records, this species could be considered uncommon. However, analysis of skeletal remains from Great Horned Owl pellets indicate otherwise. Pellets were collected at six different sites within the study area and the remains of 18 cottontails were recorded from these six sites. At least one cottontail was recorded for each site and 7 were counted from one site (Appendix 2). Cottontails were the most heavily preyed upon lagomorph in this area.

Cottontails are found in brushy areas along the Red Deer River and in the wooded sections of the Hand Hills. During one field trip to the area, we stayed in the campground at the Tolman Bridge, and cottontails were common in the campground area. The Drumheller area is at the northern limit of the cottontail range in Alberta.

Snowshoe Hare (*Lepus americanus*)

Specimen Records: (NMC) Red Deer River near Drumheller (1)

Status: Uncommon

The Snowshoe Hare is the principal prey of the Great Horned Owl in the boreal forest and aspen parkland areas of Alberta (Rusch et al. 1972). In an analysis of skeletal elements recovered from the pellets of Great Horned Owls from the Drumheller area (Appendix 3), the remains of Snowshoe Hares were found in four of six samples. Total number of individual hares identified was five in 1982 and two in 1988. Hence the classification of this species as "uncommon." In this area the Snowshoe Hare is at the southern edge of its Alberta range. It can be expected to occur in brushy or wooded areas in the Hand Hills, along the Red Deer River, and along the northern border of the study area.

White-tailed Jack Rabbit (*Lepus townsendii*)

Specimen Records: (PMA) Dorothy (2 adult males), Lyalta (1 adult male), Rockyford (1 adult male); (U of C) Little Fish Lake (1)

Status: Common

Jack rabbits occur throughout the area occupying cultivated fields as well as grasslands. They may be seen infrequently, but their carcasses are found on a regular basis along roadways where they have become victims of collisions with motor vehicles. They are seen rarely during daylight periods as their most active times are at dawn and dusk.

Measurements:
Males (N = 4) Weight: mean 2.85 kg (range 2.6 kg to 3.1 kg). Total length: mean 587.0 mm (range 565 mm to 608 mm).

Least Chipmunk (*Tamias minimus*)

Specimen Records: (PMA) Rumsey (3 adult females); (U of A) Red Deer River west of Rumsey (7); (NMC) Red Deer River 9 miles NW Drumheller (11), Red Deer River near Rumsey (1)

Status: Locally common

The Least Chipmunk is at the eastern and southern edge of its Alberta range in this area. This species prefers rocky, bushy areas in mixed coniferous and deciduous stands. Specimens housed in the Provincial Museum indicate that Least Chipmunks were caught along the Red Deer River among cottonwoods with an understorey of willows, grasses sedges, rosebushes, and thistles. The Least Chipmunk can be expected along the entire Red Deer River valley. There are no records of this species from the grassland above the river valley.

Kondla and Smith (1972) indicated that this species was present in Dry Island Buffalo Jump Provincial Park and Wallis and Wershler (1985) reported seeing four in the Little Fish Lake area.

Measurements:
Females (N = 3) Weight: mean 52.9 g (range 48.6 g to 58.4 g). Total length: mean 220.3 mm (range 216 mm to 226 mm).

Woodchuck (*Marmota monax*)

Specimen Records: No museum specimens are known

Status: Rare

Salt (1977) saw a female with three young in the Rumsey-Drumheller region in 1964-65. He did not elaborate on this observation and it is difficult to make an accurate assessment of the status of this species in the study area. There is a specimen in the University of Alberta Zoology collection from the Innisfail region just outside the northwest corner of our study area. Soper (1964) points out that the Woodchuck is associated with "... aspen poplar on rocky slopes, sand ridges, and lake and river banks." In the Drumheller study area the Woodchuck might be expected in the northern Aspen Parkland ecoregion and along the northern portion of the Red Deer River.

Richardson's Ground Squirrel (*Spermophilus richardsonii*)

Specimen Records: (PMA) Ardenode (1 adult female, 1 adult male), Hand Hills (1 adult female, 2 adult males), Knee Hill Valley (1 adult female), Nightingale (2 adult females, 1 adult male), Rumsey (1 adult male), Sunnyslope (1 adult male), Trochu (1 adult female), Tudor (1 adult female); (U of A) Little Fish Lake (2); (NMC) Munson Ferry (2); (ROM) Finnegan 14

Status: Common

The Richardson's Ground Squirrel is one of the better known and more conspicuous small mammals in the study area. Most small mammals are nocturnal and solitary, but the Richardson's Ground Squirrel is diurnal and colonial, hence it is easy to see. For many people, the sighting of the first "gopher" is a sure sign of spring. The species is found throughout the study area but it is less common in the Red Deer River valley than on the uplands and it is absent from the badlands. Bones of this species were recovered from five of six sites where pellets from Great Horned Owls were collected (Appendix 2). The largest number of individuals from one site was 19.

Measurements:
Females (N=6) Weight: mean 349.6 g (range 308.1 to 439.1 g). Total length: mean 292.7 mm (range 282 mm to 304 mm).
Males (N=7) Weight: mean 365.7 g (range 297.6 mm to 410.9 mm). Total length: mean 305.6 (range 262 mm to 328 mm).

Thirteen-lined Ground Squirrel (*Spermophilus tridecemlineatus*)

Specimen Records: (PMA) Hand Hills (1 immature female, 1 adult male), Huxley (1)

Status: Uncommon

This species should be more evident than specimen records indicate as its preferred habitat is in areas that are heavily grazed. Possibly one reason it is seldom encountered is that it is non-colonial and very secretive. Bradley and Bradley (1977) indicated that it was uncommon in the Rumsey area and Wallis and Wershler (1985) found it less common in 1984 than in 1970 in the Little Fish Lake area. Kondla and Smith (1972) indicated that this species was present at Dry Island Buffalo Jump Provincial Park but they did not indicate its status. The local range could include the western portion of the study area as specimens are known from Sundre and Calgary (PMA records).

Franklin's Ground Squirrel (*Spermophilus franklinii*)

Specimen Records: No museum specimens are known

Status: Rare

This species is included on the basis of a sight record in the Dry Island Buffalo Jump Provincial Park area (Kondla and Smith 1972). The individual was observed in "an area of thick fescue." This study area is at the southern edge of its Alberta range. There is a specimen in the Royal Ontario Museum that was collected

at Red Lodge approximately 10 km west of the Drumheller study area.

Red Squirrel (*Tamiasciurus hudsonicus*)

Specimen Records: No museum specimens are known

Status: Rare

The Red Squirrel is reported to occur in the Dry Island Buffalo Jump Provincial Park (Kondla and Smith 1972). This is the only report of this species from the Drumheller study area. The study area is considerably south and east of the Alberta range shown by Soper (1964). There are two specimens in the United States National Museum that came from Calgary. The northeast corner of the city of Calgary is included in our study area, but there is no indication where the specimens were obtained in the city.

Northern Pocket Gopher (*Thomomys talpoides*)

Specimen Records: (PMA) 7 miles east of Airdrie (1 adult female, 1 adult male), Elnora (1 adult male), Kersey (2 adult females, 3 adult males), Knee Hill Valley (1 adult female, 1 adult male), Neapolis (1 adult female), Sunnyslope (2 adult females, 1 adult male), Torrington (2 adult females)

Status: Uncommon

The pocket gopher has a limited distribution in the study area. It is found along the western edge of the area from Calgary to east of Bowden and along the northern border from Bowden to Elnora. Nowhere is the pocket gopher common in this described range. It is absent from the grassland and parkland areas to the east and southeast. Wallis and Wershler (1985) reported it from the Little Fish Lake area. Their only comment on this species was "noted in fescue grassland in 1977." It is difficult to assess this record in light of the known distribution.

Measurements:
Females (N=9) Weight: mean 130.9 g (range 115.8 g to 172.5 g). Total length: mean 218.9 mm (range 207 mm to 226 mm).

Males (N=7) Weight: mean 169.9 g (range 132.8 g to 211.0 g). Total length: mean 231.3 mm (range 221 mm to 252 mm).

Beaver (*Castor canadensis*)

Specimen Records: No museum specimens are known

Status: Common

The lack of museum specimens does not reflect the status of this species in the study area. Beavers occur along the Red Deer River and in the numerous creeks entering the river. The only restricting condition on their occurrence is the absence of water and willows and poplars.

Deer Mouse (*Peromyscus maniculatus*)

Specimen Records: (PMA) Dry Island Buffalo Jump (5 adult females, 3 adult males, 2 subadult females, 3 subadult males, 2 immature females), Elnora (1 adult female, 2 subadult females, 2 subadult males), Hand Hills (13 adult females, 2 adult males, 3 subadult females, 14 subadult males, 1 immature female), Hesketh (2 adult males, 1 immature male), Knee Hill Valley (1 adult male, 1 subadult female), Munson Ferry (2 adult males, 4 subadult females, 2 subadult males), Nightingale (2 adult females, 3 adult males, 1 subadult female, 1 subadult male), Rockyford (2 adult males, 4 subadult males, 2 immature females, 3 immature males), Rumsey (15 adult females, 24 adult males, 18 subadult females, 28 subadult males, 7 immature females, 5 immature males), Trochu (1 adult female, 4 adult males, 3 subadult males), Wintering Hills (1 adult female, 3 adult males, 7 subadult males, 21 immature males); (U of A) Drumheller (2), Irricana (2), Little Fish Lake (3), Red Deer River W of Rumsey (6); (NMC) Munson Ferry (7), Red Deer River 9 miles NW Drumheller (4), Red Deer River near Rumsey (2), Rosebud (1), Tp28-R21-W4 (8); (MVZ) Hand Hills-Morrin (1)

Status: Common

This is the most common and widely distributed small mammal in the area. It occupies all but the wettest habitats including buildings. In an analysis of mammal bones recovered from owl pellets (both Great Horned Owl and Burrowing Owl) this species showed

up at all sites and it was the most abundant species taken by these owls (Appendices 2, 3, 4).

Measurements:
Females: Weight (N=37): mean 25.4 g (range 20.3 g to 33.4 g). Total length (N=35): mean 164.3 mm (range 137 mm to 176 mm).
Males (N=41): Weight: mean 22.5 g (range 20.0 g to 28.5 g). Total length: mean 157.2 mm (range 140 mm to 181 mm).

Data were recorded for 20 pregnant females including two subadult females. One, caught 20 April 1988, had six embryos with a crown-rump length of 3 mm. The other, caught 11 July 1985, had 5 embryos with a crown-rump length of 2 mm. The earliest seasonal date that an adult, pregnant female was caught was 17 June 1986 and the latest date was 8 September 1975. The number of embryos ranged from 3 to 9.

Northern Grasshopper Mouse (*Onychomys leucogaster*)

Specimen Records: No museum specimens are known

Status: Locally common

In an analysis of mammal bones recovered from Great Horned Owl pellets, this species occurred at all six sites with 73 individuals counted (Appendix 2). All the owl pellets were collected in the southeastern portion of the study area. On the basis of this owl pellet study, the range of the grasshopper mouse in this study area extends from Tp25-R16-W4 in a northwesterly direction to Tp33-R21-W4. The greatest abundance of the species is in the extreme southeast corner, hence the status "locally common."

Bushy-tailed Woodrat (*Neotoma cinerea*)

Specimen Records: (PMA) Strathmore (1 adult male)

Status: Accidental

The specimen, collected April 1970, was obtained by the Provincial Museum from the Alberta Fish and Wildlife Division. Enquiries regarding the circumstances surrounding the collecting of the specimen were unsuccessful. Strathmore is some distance from the known Alberta range of this species (Soper 1964), hence the status designation "accidental." This means that although the species occurred in the area once, there is no evidence to indicate that a population occurs there and it is not expected to occur again.

Measurements:
Weight: 279.5 g. Total length: 405 mm.

Southern Red-backed Vole (*Clethrionomys gapperi*)

Specimen Records: (PMA) Dry Island Buffalo Jump (1 adult female, 1 adult male, 1 immature female), Elnora (1 adult female, 1 immature female), Hand Hills (1 adult female, 1 adult male, 1 subadult female, 1 subadult male, 5 immature males), Neapolis (1 subadult female), Rumsey (7 adult females, 2 adult males, 16 subadult females, 12 subadult males, 11 immature females, 8 immature males), Trochu (2 subadult males, 1 immature male)

Status: Locally common

The red-backed vole approaches the southern and eastern edge of its Alberta range in this area. It is found in the northern one-third of the study area with an extension into the Hand Hills. Habitat notes indicate a preference for stands of Aspen Poplar with an understorey of snowberry, rosebushes, thistles, and grasses. Two pregnant females were taken in the area. One, caught 28 July 1982, had six embryos with a crown-rump length of 6 mm. The other female was taken 18 August 1986 with six embryos with a crown-rump length of 10 mm to 11 mm.

Measurements:
Females (N=10): Weight: mean 25.6 g (range 20.4 g to 29.4 g). Total length: mean 138.6 mm (range 123 mm to 147 mm).
Males (N=4): Weight: mean 22.5 g (range 20.6 g to 26.0 g). Total length: mean 133.5 mm (range 127 mm to 140 mm).

Meadow Vole (*Microtus pennsylvanicus*)

Specimen Records: (PMA) Dalroy (2 adult males), Dry Island Buffalo Jump (1 adult female, 4 adult males, 1 subadult female, 1 subadult male, 1 immature sex not determined), Hand Hills (1 adult female, 2 subadult males, 1 immature male), Nightingale (1 adult male),

Rumsey (3 adult females, 1 adult male, 3 subadult females), Tolman Bridge (1 adult male), Trochu (4 adult males, 1 subadult female), Wintering Hills (2 adult females, 1 adult male, 2 subadult males); (U of A) Irricana (1); (NMC) Red Deer River 9 miles NW Drumheller (1), Rosebud (1); (U of C) Cheadle (1)

Status: Common

The Meadow Vole is widely distributed throughout the area. It was collected in a variety of habitats but was most common along creeks with a dense growth of willows, rosebushes, thistles, and grasses. In an analysis of mammal bones found in owl pellets, this species occurred at all sites where pellets were collected and was the second most frequently taken small mammal (Appendices 2, 3, 4). One female, collected 15 August 1986, was pregnant with five embryos that had a crown-rump length of 20 mm to 22 mm.

Measurements:
Females (N=7): Weight: mean 29.1 g (range 20.7 g to 38.6 g). Total length: mean 137.9 mm (range 108 mm to 163 mm).
Males (N=13): Weight: mean 33.6 g (range 20.3 g to 50.4 g). Total length: mean 151.2 mm (range 124 mm to 170 mm).

Prairie Vole (*Microtus ochrogaster*)

Specimen Records: No museum specimens are known

Status: Rare

Salt (1977) reported finding skull fragments of this species in a coyote scat and an owl pellet that had been picked up in the Rumsey area. This species is not common in Alberta. Most specimens have been collected in the Vermilion area. The Royal Ontario Museum has one specimen from the Didsbury region just west of our study area and another six specimens from the Red Deer area. The Prairie Vole is usually found in upland prairies (Jones et al. 1983) enclosed by aspen woods (Soper 1964).

Sagebrush Vole (*Lagurus curtatus*)

Specimen Records: (NMC) Red Deer River 9 miles NW Drumheller (2)

Status: Locally common

The Sagebrush Vole is restricted to the southeast portion of the study area. It is an animal of the semi-arid prairies where sagebrush or dense grasses dominate (Carroll and Genoways 1980), hence the limited distribution in our area. Trapping results are a poor indication of the abundance of this species. Results of an analysis of mammal bones recovered from owl pellets showed this species occurring in five of six sites where owl pellets were collected (Appendix 2). It was the fourth most common species taken by the owls in the region.

Muskrat (*Ondatra zibethicus*)

Specimen Records: (PMA) Ardenode (1 immature female, 2 immature males), Nightingale (1 adult female, 1 immature male), Rumsey (1 adult female, 1 subadult male); (U of A) Trochu (1)

Status: Locally common

The Muskrat is found along the Red Deer River and wherever there is permanent or long-standing water. It is more common in the north and west and less common in the southeast.

Measurements:
Females (N = 2): Weight 1.0 kg each. Total length: mean 546.5 mm (range 560 mm to 533 mm).

House Mouse (*Mus musculus*)

Specimen Records: (PMA) Dry Island Buffalo Jump (1 adult female, 2 adult males), Rumsey (1 adult male, 1 subadult female); (U of A) Drumheller (1); (NMC) Red Deer River 9 miles NW Drumheller (1), Rosebud (1)

Status: Common

Because this mouse is closely associated with people, it can be expected to occur anywhere in the area. When it occupies houses where people live it is subject to control measures. The specimens in the Provincial Museum were caught away from human habitation along the Red Deer River indicating that individuals do live in "wild" situations in this area. One partial skull was recovered from a Great Horned Owl pellet. A female, caught 21 July 1982 at Dry Island

Buffalo Jump, was pregnant, with eight embryos with an average crown-rump length of 5 mm.

Measurements:
Females (N=1): Weight: 16.9 g. Total length: 163 mm.
Males (N=3): Weight: mean 17.4 g (range 16.0 g to 18.4 g). Total length: mean 163.7 mm (range 157 mm to 173 mm).

Meadow Jumping Mouse (*Zapus hudsonius*)

Specimen Records: (PMA) Rumsey (2 immature males), Trochu (2 immature females); (U of A) Sullivan Lake (1)

Status: Uncommon

The Meadow Jumping Mouse is at the southern limit of its Alberta range in this area. It occurs in a narrow band along the northern edge of the study area. Whitaker (1972) indicated that this species occurs in "... thick vegetation along ponds, streams, and marshes...." The specimens in the Provincial Museum were taken in a complex of willow, rosebushes, grasses, and thistle along the Red Deer River and Threehills Creek.

Western Jumping Mouse (*Zapus princeps*)

Specimen Records: No museum specimens are known

Status: Rare

This species is included in this area on the basis of a partial skull recovered from a Great Horned Owl pellet (Appendix 2). The pellet was collected in Tp26-R18-W4 in July 1988. The Western Jumping Mouse is thinly distributed throughout the grasslands of southern Alberta. Hence, it is not surprising that it has not been encountered during trapping programs in this area. Although the status of this species is "rare" in this area, elsewhere in Alberta it is common.

Porcupine (*Erethizon dorsatum*)

Specimen Records: (PMA) Trochu (1 immature female); (NMC) Knee Hill Valley (1); (ROM) Drumheller (1)

Status: Common

Porcupines occur throughout the area. Although they are rarely seen alive, they are frequently killed by motor vehicles especially in late summer and early fall. Soper (1964) indicated that the habitat of the Porcupine is along "brushy coulees, sagebrush flats, and wooded bottomlands" of streams. In this study area Porcupines can be expected along the Red Deer River and coulees feeding into this river valley.

Coyote (*Canis latrans*)

Specimen Records: No museum specimens are known

Status: Common

Although museum specimen records for Coyotes from this area are lacking, this is not a reflection of the abundance of this species here. Coyotes occur throughout the area and they are relatively common. In 1985, during work by the mammalogy program of the Provincial Museum, Coyotes were observed on three occasions in the Standard area. In the Hand Hills, members of the Museum's paleontology program heard and saw Coyotes on several occasions from 1984 to 1987 (J. Burns pers. comm.). In April 1988, 2 Coyotes were seen in the Sunnyslope area by Museum personnel. Fehr (1982) reported 22 sightings and one active den in the Rumsey area. Kondla and Smith (1972) reported Coyotes from Dry Island Buffalo Jump Provincial Park but gave no indication as to their abundance. Wallis and Wershler (1985) indicated that Coyotes were "commonly seen" in the Little Fish Lake area. They also reported that a den had been found the in area in 1970.

Red Fox (*Vulpes vulpes*)

Specimen Records: (U of A) Red Deer canyon near Drumheller (1)

Status: Uncommon

The Red Fox should occur throughout the region, but records, either sight or specimen, are inadequate to assess its distribution or abundance. It is difficult to get first hand accounts for this species. In April 1988, a Red Fox was seen in the community of Acme by Museum personnel.

Black Bear (*Ursus americanus*)

Specimen Records: No museum specimens are known

Status: Accidental

D. B. Schowalter (pers. comm.) reported that a Black Bear had been shot near Rosebud in 1988. Pat Dunford, a Fish and Wildilfe Officer, confirmed this report and informed me that this bear was first reported in the Strathmore area. It subsequently moved to the East Coulee area and was eventually killed by a farmer when it threatened his wife.

Grizzly Bear (*Ursus arctos*)

Specimen Records: No museum specimens are known

Status: Extirpated

Grizzly Bears do not occur in this area now and probably have not for approximately 100 years. The following account, by John Macoun (1882:336-339), recounts a story of a Grizzly Bear that had been killed in the Hand Hills in 1877.

> [It] required eight shots before he was disabled. His feet were eight inches across, and were armed with claws five inches long. He was caught in the act of killing a buffalo cow, and had just cracked her spine when he received the first shot. When stretched, his hide was as large as a buffalo bull, and when seen by me was used as a cart cover. The skull was brought away, and is now in the museum of Toronto University. Scarcely a tooth was found in his head which had not been broken, but the breadth of their bases told of their power unimpaired. The whole hide was covered with old wounds, and his general appearance led to the belief that he was very old. Besides the balls shot into him by his slayer, a number of others were found imbedded in his flesh.

The mammalogy department at the Royal Ontario Museum was contacted with respect to the skull mentioned in this story. They were not able to shed any light on its whereabouts. The only skull of an Alberta plains Grizzly Bear is in the National Museum of Natural Sciences in Ottawa. This skull was collected in 1917 along the Little Sandhill Creek, approximately 50 km southeast of the area covered by this study.

Raccoon (*Procyon lotor*)

Specimen Records: No museum specimens are known

Status: Uncommon

Fish and Wildlife personnel in the Drumheller office report that Raccoons are occasionally trapped along the Red Deer River. Pat Dunford (pers. comm.) reported that he had observed Raccoon tracks in the Rosedale area just outside the city of Drumheller. He also advised that Raccoons or their tracks had been seen in the Rumsey and Michichi areas. Raccoons are relatively common in southern Alberta (Smith 1986) and they occur in the Edmonton area (Smith 1979). The Provincial Museum has specimens from the Bindloss area, approximately 110 km east of this study area and from Sylvan Lake approximately 40 km north of the area.

Ermine (*Mustela erminea*)

Specimen Records: (NMC) Rosebud (3)

Status: Uncommon

The Ermine may be expected to occur throughout the area as there are museum specimens from several places surrounding the Drumheller study area, such as Hanna, Brooks, Didsbury, and Calgary. Within this study area the Ermine is not common and any records of its occurrence are worth reporting. Besides the specimens from Rosebud, Ermine bones have been recovered from owl pellets collected in the Rumsey and Dry Island Buffalo Jump areas (Appendices 2 and 3).

Least Weasel (*Mustela nivalis*)

Specimen Records: (NMC) Rosebud (1); (U of C) Chestermere Lake east of Calgary (1)

Status: Uncommon

The Least Weasel is a small, secretive predator that is seldom seen. Hence, it may be more common than specimen records indicate. It can be expected to occur throughout the study area. Among mammal bones recovered

from owl pellets, bones of this weasel occurred at three sites in the Michichi area (Appendix 2). Fehr (1982) reported one sight record for the Rumsey area.

Long-tailed Weasel (*Mustela frenata*)

Specimen Records: (U of A) Rockyford (1), Strathmore 4 miles east 1; (NMC) Rosebud (1); (ROM) Calgary (2)

Status: Uncommon

This weasel is found throughout the study area and although it is the most common weasel in the area, it is not abundant. It occurs in both grassland and wooded habitats. In a study of mammal bones recovered from Great Horned Owl pellets, seven individuals from two sites were recorded (Appendix 2). Boxall (1979) indicated that Long-tailed Weasels may also fall prey to Snowy Owls. Wallis and Wershler (1985) reported seeing this species in the Little Fish Lake area in 1970.

Black-footed Ferret (*Mustela nigripes*)

Specimen Records: No museum specimens are known

Status: Hypothetical

There is only one specimen record for this species from Alberta. This specimen was obtained 15 May 1901 at Gleichen (Field Museum of Natural History records), approximately 10 km south of our study area. Anderson (1946) reported a record from Rosebud. He did not indicate where this record originated or whether it was supported by a specimen. Because of a lack of specimen records and the present known distribution of this species, there is very little likelihood that it will occur in this area, hence the hypothetical status designation. However, Laing and Holroyd (1989) included two sight records of this species from Carbon and Rockyford.

Mink (*Mustela vison*)

Specimen Records: (PMA) Nightingale (1 adult female)

Status: Uncommon

The Mink is closely associated with water. The availability of streams and marshes limits the distribution of the species. In this region Mink may be found throughout the area but it is rare in the southeast. Mink consume a variety of aquatic organisms but one of the main components of their diet is Muskrat. Where Muskrats are common, Mink will invariably be found. Because they are secretive animals, Mink are seldom seen.

The one specimen collected in the area was taken 1 July 1985. It weighed 737.2 g with a total length of 535 mm.

Badger (*Taxidea taxus*)

Specimen Records: (ROM) Munson (1)

Status: Uncommon

Badgers can be expected to occur throughout the area. They are, however, subject to persecution by farmers and ranchers and are infrequently encountered. In July 1985, Museum personnel saw two badgers, one near Ardenode and the other near Keoma. Wallis and Wershler (1985) reported the species for Little Fish Lake area. Kondla and Smith (1972) indicated that the species was sparsely distributed in Dry Island Buffalo Jump. Fehr (1982) indicated that Badgers are rarely seen in the Rumsey area.

Striped Skunk (*Mephitis mephitis*)

Specimen Records: No museum specimens are known

Status: Common

Although the Striped Skunk is common throughout the area, specimen records are scarce. This is no doubt more a reflection of the reluctance of museum people to collect specimens than it is of the status of the species in the area. There is one report by Museum personnel of a dead skunk on a road near Beiseker in April 1988. The specimen was smashed too badly to salvage. Bradley and Bradley (1977) indicated that the Striped Skunk was present in the Rumsey area but that its status was unknown.

Cougar (*Felis concolor*)

Specimen Records: No museum specimens are known

Status: Uncommon

Pat Dunford (pers. comm.) stated that while he was stationed in Drumheller, Cougars were reported to him on a regular basis. Sightings had been reported from the vicinity of East Coulee and Little Fish Lake areas. Dunford believed there was a good possibility that Cougars could be resident in the study area. Cougars have been reported from the Medicine Hat area (Brown 1947) and the Cypress Hills (Soper 1964). The Provincial Museum has a specimen that was collected in the Athabasca area. All of these localities are at some distance from the mountain habitat with which Cougars are usually associated.

Canada Lynx (*Lynx canadensis*)

Specimen Records: No museum specimens are known

Status: Rare

Kondla and Smith (1972) reported that residents in the Dry Island Buffalo Jump area indicated that lynx occur during some winters. D. B. Schowalter (pers. comm.) said that his brother had killed a lynx at Rumsey about 1960. Pat Dunford (pers. comm.) said he had never had a verified report of lynx from the Drumheller area. Weseloh (1974) reported seeing a lynx between Rockyford and Redland.

Bobcat (*Lynx rufus*)

Specimen Records: No museum specimens are known

Status: Rare

The Drumheller Fish and Wildlife office has received reports of Bobcats being killed by motor vehicles in the area. No specimens have been examined, however. There is also a report of a Bobcat being seen in the Hand Hills (Pat Dunford pers. comm.). Dunford believed that Bobcats occur in the Red Deer River valley and tributary coulees where cottontails are common.

Mule Deer (*Odocoileus hemionus*)

Specimen Records: No museum specimens are known

Status: Common

Mule Deer occur throughout the area but they are most common in the valley of the Red Deer River. Wallis and Wershler (1985) indicated that Mule Deer were seen regularly in coulees in the Little Fish Lake area. Fehr (1982) reported 13 sightings in the Rumsey area and he considered them fairly common. Kondla and Smith (1972) reported that the Mule Deer is present in all areas of the river valley in Dry Island Buffalo Jump Provincial Park.

White-tailed Deer (*Odocoileus virginianus*)

Specimen Records: (U of A) Rosebud (1); (U of C) Torrington (1)

Status: Common

The White-tailed Deer is found adjacent to woodlots in most upland areas. It may be found throughout the region but it is less common on the more open grasslands. Fehr (1982) reported 19 sightings in the Rumsey area. Bradley and Bradley (1977) said this species was less numerous than Mule Deer for the same area.

Moose (*Alces alces*)

Specimen Records: No museum specimens are known

Status: Locally common

Kondla and Smith (1972) did not see this species but indicated that residents in the Dry Island Buffalo Jump area reported Moose occasionally in the river valley. Fehr (1982) also indicated that Moose are seen in the Rumsey ecological reserve area. D. B. Schowalter (pers. comm.) said that Moose are seen around Delia and Craigmyle and that individuals of both sexes and various ages are seen regularly in the Dry Island Buffalo Jump area indicating that breeding occurs there. Pat Dunford (pers. comm.), reported that Moose are common in the Dry Island Buffalo Jump area and have been reported in the Hand Hills.

Pronghorn (*Antilocapra americana*)

Specimen Records: No museum specimens are known

Status: Common

Pronghorn prefer native grasslands and tend to avoid areas of extensive cultivation. In this study area, small bands occur in the extreme southeast and along the eastern border. The species has been seen by Museum personnel in the Morrin area and between Drumheller and the Hand Hills. Wallis and Wershler (1985) reported sightings of up to 19 in one day in the Little Fish Lake area and they indicated that Pronghorn were most common in mixed grasslands. Fehr (1982) said Pronghorn were usually seen in the Rumsey area until late June.

Bison (*Bison bison*)

Specimen Records: No museum specimens are known

Status: Extirpated

If Bison occur in the area today they occur on private farms and ranches. None exist in the wild.

As early as the summer of 1859 there was some indication that Bison numbers were declining in the area. John Palliser was in the vicinity of the Hand Hills that year and was "disappointed" that there were no Bison there (Roe 1951). By 1871, Indians in the area of the Hand Hills were in danger of starving because of a shortage of Bison (Roe 1951). In 1882, Macoun reported that "the buffalo are all gone..." (Macoun 1882), but in 1884 J. B. Tyrrell "encountered a band of about 20" along the Red Deer River valley south of the Hand Hills, five were killed by Indians and six were not accounted for (Seton 1909). These were possibly the last wild Bison to be seen in this area.

SPECIES OF POSSIBLE OCCURRENCE IN THE DRUMHELLER AREA

There is no evidence that the following species are found in the study area but historical and current ranges suggest they are candidates for occurrence.

Norway Rat (*Rattus norvegicus*)

This species is under strict control measures and whenever its occurrence is reported, immediate steps are taken to eliminate it. Alberta Agriculture pest control personnel indicated that rats can occur wherever people occur and there is a means of transportation to those people - especially rail and commercial trucking services. It would come as no surprise to hear of rats occurring at some time in the Drumheller area.

Gray Wolf (*Canis lupus*)

Wolves, no doubt, occurred within the study area when Bison were in the area. No mention of their presence has been made in the literature that is available. Wolves are known to wander great distances from what is considered their normal range. The Provincial Museum of Alberta has a specimen, collected 31 October 1973, from the Fenn area which is less than 20 km north of the study area. The Field Museum of Natural History in Chicago has four specimens, collected in 1901, from the Gleichen area.

DISCUSSION

Several times in the history of our study area, the entire region was covered with ice. Then, several thousand years ago, the ice left. As environmental conditions changed, the assemblage of mammals as we now know it became established. By examining the North American ranges of the mammals that are found here, it is possible to assign species to different faunal elements (Armstrong 1972). By looking at the mammalian fauna in this way some understanding of the faunal history of the study area may be gleaned.

Fifty of the 52 species of mammals that are reported to occur in the study area are included in the following biogeographic discussion. The Black-footed Ferret has not been included as its presence in the region is hypothetical. The House Mouse is also not included. Although it is now part of the fauna of the area, it arrived here with European settlers. Hence, it adds no insight into the dispersal patterns of the native fauna.

Four faunal elements are identified with respect to the mammals of the Drumheller area (Table 1). However, many species have ranges that are so extensive that it is not possible to assign them to any one element.

Table 1. Faunal elements for mammals found in the Drumheller study area.

Faunal Element	Species	
Boreal (11 species)	masked shrew	meadow jumping mouse
	showshoe hare	ermine
	least chipmunk	least weasel
	red squirrel	Canada lynx
	southern red-backed vole	moose
	meadow vole	
Campestrian (8 species)	prairie shrew	Richardson's ground squirrel
	Franklin's ground squirrel	thirteen-lined ground squirrel
	white-tailed jack rabbit	prairie vole
	northern grasshopper mouse	pronghorn
Cordilleran (3 species)	dusky shrew	western jumping mouse
	bushy-tailed woodrat	
Eastern Deciduous (1 species)	woodchuck	
Great Basin (4 species)	long-eared bat	northern pocket gopher
	Nuttall's cottontail	sagebrush vole
Widespread (23 species)	little brown bat	grizzly bear
	western small-footed bat	raccoon
	silver-haired bat	long-tailed weasel
	big brown bat	mink
	hoary bat	badger
	beaver	striped skunk
	deer mouse	cougar
	muskrat	bobcat
	porcupine	mule deer
	coyote	white-tailed deer
	red fox	bison
	black bear	

The term "widespread" is used for species in this category.

Twenty-three species are "widespread." Included are five species of bats, four rodents, eleven carnivores, and three ungulates. Although common and widely distributed, the Beaver and Muskrat are both restricted to aquatic environments. The Deer Mouse, on the other hand, has wide ecological tolerances and is found in all but the wettest situations. The highly mobile bats are found essentially in the vicinity of the Red Deer River where there are sufficient trees and water to meet their needs. The carnivores and the ungulates are also wide ranging species. Two species, the Grizzly Bear and Bison, have been extirpated. The Black Bear is accidental and may not be expected to occur again. The Raccoon has been increasing in numbers in recent years and may be expected to occur throughout the study area. The situation with respect to the Cougar is unclear. If the populations of Mule Deer and White-tailed Deer remain high, Cougars may well continue to be present in the area. If the populations of the prey species decrease, Cougars may become agricultural pests and suffer from control activities.

The next largest contributor to the mammalian fauna of the area is the Boreal Faunal Element. Eleven species are associated with this Element. Seven species: Masked Shrew, Snowshoe Hare, Least Chipmunk, Red Squirrel, and Meadow Jumping Mouse, are at the southern or eastern limit of their Alberta range in the area. Their status is uncommon. Two other species are also uncommon, but have wider distribution patterns: the Ermine and Least Weasel may be found throughout the region. The Southern Red-backed Vole is locally common but is restricted to those areas with trees. It is found as far south as the Hand Hills but is absent in the Wintering Hills. The Meadow Vole is the only Boreal species that is common and widely distributed. The valley of the Red Deer River from the north was the probable avenue by which such species as the Least Chipmunk, Red Squirrel, Canada Lynx, and Moose moved into the area. The Masked Shrew, Snowshoe Hare, red-backed vole, Meadow Vole, Meadow Jumping Mouse, Ermine, and Least Weasel moved to the area from the north or northwest along the edge of the Aspen Parkland ecotone.

Eight species represent the Campestrian Faunal Element. Species in this group are associated with open grassland environments centred in the northern Great Plains. Two species are common and are widely distributed in the area: the White-tailed Jack Rabbit and the Richardson's Ground Squirrel. As more land comes under cultivation and pest control programs are emphasized these species are severely affected. They may be less common now than in previous years. The Northern Grasshopper Mouse is locally common but it is essentially restricted to the arid southeast one-quarter of the area. It is at the northern limit of its Alberta range in this area. The Prairie Shrew, Thirteen-lined Ground Squirrel, Franklin's Ground Squirrel, and Prairie Vole have limited distribution in the study area and are at the western limit of their range here. All species in this group arrived in the area from the east or southeast.

The Great Basin Faunal Element contributed four species to the fauna of the area: Long-eared Bat, Nuttall's Cottontail, Northern Pocket Gopher, and Sagebrush Vole. The cottontail and Sagebrush Vole are found in the Mixed Grass and Short Grass ecoregions. The cottontail is found in brushy coulees while the Sagebrush Vole is found in the uplands near sagebrush. Both species are at the northern limit of their Alberta range in this area. The cottontail probably arrived in the area from the southwest while the Sagebrush Vole arrived from the south or southeast. The Long-eared Bat arrived from the southwest and is associated with the riverine trees and rocky outcrops along the Red Deer River. It is at the northern and eastern limits of its range here. The Northern Pocket Gopher is restricted to the western and northern portions of the study area. It is found in cultivated areas in the Fescue Grass and Aspen Parkland ecoregions. It arrived in the area from the west or southwest.

Three species have Cordilleran affinities: Dusky Shrew, Bushy-tailed Woodrat, and Western Jumping Mouse. The latter two species are included in the fauna of this area on the basis of single specimens. The woodrat is considered accidental and the jumping mouse is rare. Until further specimens of these species are obtained, it is not possible to make further comment on their status or direction of dispersal. The Dusky Shrew has been taken in the Hand Hills and the Wintering Hills and skeletal remains have also been recovered from owl pellets. It is, however, nowhere common. It probably arrived in the area from the west or northwest.

The Woodchuck is the only representative of the Eastern Deciduous Faunal Element. It barely enters the northern margin of our area and is not common. Its dispersal route to the area is from the north or northwest.

Smith (1979, 1986) studied mammals in the areas covered by the Edmonton map sheet and the Foremost map sheet. The Drumheller area is approximately midway between these two areas. The relative contributions of Faunal Elements to the mammalian faunas of each region is given in Table 2. There were 51 species reported in the Foremost study, 50 in the Edmonton study, and 50 in the Drumheller study, Drumheller shares 43 species with Foremost and 42 species with Edmonton. None of the mammals in the Drumheller study area is unique to the area; all species are shared by either the Foremost area or the Edmonton area. In this respect the Drumheller area is unique in that it is an area where northern and southern mammals meet in almost equal numbers. Because of this, it can not be classified as either a northern area or a southern area but as a transition zone. As many species reach the northern or southern limits of their Alberta range in this area climatic change may dramatically alter the mammalian fauna. For this reason it will be important to monitor mammal distributions in the region as a clue to the significance of environmental change.

Table 2. Number of species from various faunal elements for three areas in Alberta.

Faunal Element	Foremost	Drumheller	Edmonton
Boreal	8	11	16
Campestrian	8	8	6
Cordilleran	5	3	3
Eastern Deciduous	0	1	2
Great Basin	5	4	1
Sonoran	1	0	0
Widespread	24	23	22

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Appendix 1. Checklist Of Mammals Of The Drumheller Map Sheet Area 82P

Masked Shrew (*Sorex cinereus*)
Prairie Shrew (*Sorex haydeni*)
Dusky Shrew (*Sorex monticolus*)
Little Brown Bat (*Myotis lucifugus*)
Long-eared Bat (*Myotis evotis*)
Western Small-footed Bat (*Myotis ciliolabrum*)
Silver-haired Bat (*Lasionycteris noctivagans*)
Big Brown Bat (*Eptesicus fuscus*)
Hoary Bat (*Lasiurus cinereus*)
Nuttall's Cottontail (*Sylvilagus nuttallii*)
Snowshoe Hare (*Lepus americanus*)
White-tailed Jack Rabbit (*Lepus townsendii*)
Least Chipmunk (*Tamias minimus*)
Woodchuck (*Marmota monax*)
Richardson's Ground Squirrel (*Spermophilus richardsonii*)
Thirteen-lined Ground Squirrel (*Spermophilus tridecemlineatus*)
Franklin's Ground Squirrel (*Spermophilus franklinii*)
Red Squirrel (*Tamiasciurus hudsonicus*)
Northern Pocket Gopher (*Thomomys talpoides*)
Beaver (*Castor canadensis*)
Deer Mouse (*Peromyscus maniculatus*)
Northern Grasshopper Mouse (*Onychomys leucogaster*)
Bushy-tailed Woodrat (*Neotoma cinerea*)
Southern Red-backed Vole (*Clethrionomys gapperi*)
Meadow Vole (*Microtus pennsylvanicus*)
Prairie Vole (*Microtus ochrogaster*)
Sagebrush Vole (*Lagurus curtatus*)
Muskrat (*Ondatra zibethicus*)
House Mouse (*Mus musculus*)
Meadow Jumping Mouse (*Zapus hudsonius*)
Western Jumping Mouse (*Zapus princeps*)
Porcupine (*Erethizon dorsatum*)
Coyote (*Canis latrans*)
Red Fox (*Vulpes vulpes*)
Black Bear (*Ursus americanus*)
Grizzly Bear (*Ursus arctos*)
Raccoon (*Procyon lotor*)
Ermine (*Mustela erminea*)
Least Weasel (*Mustela nivalis*)
Long-tailed Weasel (*Mustela frenata*)
Mink (*Mustela vison*)
Badger (*Taxidea taxus*)
Striped Skunk (*Mephitis mephitis*)
Cougar (*Felis concolor*)
Canada Lynx (*Lynx canadensis*)
Bobcat (*Lynx rufus*)
Mule Deer (*Odocoileus hemionus*)
White-tailed Deer (*Odocoileus virginianus*)
Moose (*Alces alces*)
Pronghorn (*Antilocapra americana*)
Bison (*Bison bison*)

Appendix 2. Analysis of Great Horned Owl pellets (July 1988)

Species	Site					
	1	2	3	4	5	6
Shrew	4					
Masked Shrew			2	5	5	4
Prairie Shrew		1	1	3	2	7
Dusky Shrew		1		1	1	
Myotis sp.	1					
Big Brown Bat						1
Nuttall's Cottontail	7	1	2	1	1	6
Snowshoe Hare			1			1
White-tailed Jack Rabbit					1	
Richardson's Ground Squirrel	19		1	1	1	4
Deer Mouse	242	67	110	124	148	469
Northern Grasshopper Mouse	16	39	4	5	3	6
Southern Red-backed Vole			1			1
Meadow Vole	41	9	26	18	23	54
Sagebrush Vole	44		17	1	3	1
Muskrat					2	
House Mouse			1			
Western Jumping Mouse		1				
Ermine					1	
Least Weasel				1	1	1
Long-tailed Weasel	6					1

Sites where Great Horned Owl pellets were collected

1) SE4-25-16-W4
2) SW26-26-18-W4
3) SE32-29-15-W4
4) NE25-29-19-W4
5) NE19-30-18-W4
6) 30-19-W4

Appendix 3. Analysis of Great Horned Owl pellets-Dry Island Buffalo Jump (1982).

Species	Site 1	2	3	4	5	6
Masked Shrew		1				1
Dusky Shrew				5		
Little Brown Bat						1
Snowshoe Hare		1		2	1	1
White-tailed Jack Rabbit				1		
Richardson's Ground Squirrel		1	1			1
Northern Pocket Gopher	1	1	1	12	1	3
Deer Mouse	17	14		113	21	44
Northern Grasshopper Mouse						1
Southern Red-backed Vole	1					
Meadow Vole	1	15	1	13	10	8
Ermine		2				

Sites where Great Horned Owl pellets were collected

1) NE21-33-21-W4 (20 July 1982)
2) Old barn 10.5 km south (12 May 1982)
3) Dry Island Park 30-24-21-W4
4) 0.5 miles west Buffalo Jump (12 May 1982)
5) Old barn west Buffalo Jump (12 May 1982)
6) 3-33-21-W4 (20 July 1982)

Appendix 4. Analysis of Burrowing Owl pellets (July 1984)

Species	Site 1	2
Prairie Shrew	1	
Deer Mouse	18	10
Meadow Vole	6	2
Sagebrush Vole	6	14

Sites where Burrowing Owl pellets were collected (July 1984).

1) 24-16-W4
2) 12-25-15-W4

N.L.C. - B.N.C.
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